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Abstract

NUCLEAR CROSS SECTIONS FOR FAST REACTORS

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The 16-group YOM cross section set for fast reactor analysis has been widely used by fast reactor centres during the last three years. Since its publication at the end of 1960 [1], a considerable amount of experimental results as well as related theoretical investigations have become known. Many comments and queries on the different cross sections as well as requests to enlarge the energy range for both higher and lower energy neutrons have been received. It has become necessary therefore to re-examine the YOM set and extend it to include the new developments, both experimental and theoretical, and also to widen its energy range in order to facilitate analysis of problems where higher and lower energy neutrons become of importance.

A revised 16-group cross section set will be presented where account will be taken of:-

(a) New information on neutron angular distributions [2]
(b) Modified inelastic scattering matrices necessitated by different nuclear temperatures and statistical model calculations [3]
(c) Modified capture cross sections of the fissile nuclides
(d) Modified ν-values of U^{235}
(e) Various modified cross section values where errors and ommissions have been found during the last three years.

An extension of the 16-group set to a 20-group set by adding 4 groups in the 2 - 14 MeV range will also be presented. This permits the consideration of reactions which are neglected in current practice and which are of importance in the MeV range.

These are the (n,p), (n,α) and (n,2n) reactions. A detailed study of the MeV range, extending up to 14 MeV, will facilitate analysis of experimental results obtained with pulsed neutron sources. A finer group structure above the U^{238} fission threshold enables study of the fine structure of the flux in this region.

Another extension of the YOM set, below the present boundary of 0.5 KeV, is in progress. This will enable spectrum analysis of neutrons in the large fast reactors under consideration now, in blankets and in Doppler calculations. The lower energy extension, however, will be presented elsewhere.

REFERENCES

[1] YIFTAH, S., OKRENT, D. and MOLDAUER, P.A., Fast Reactor Cross Sections, Pergamon Press (1960).

[2] GOLDBERG, M.D., MAY, V.M. and STEHN, J.R., Angular Distributions in Neutron-Induced Reactions, USAEC Report, BNL-400, Second edition (1962).

[3] Inelastic Scattering Cross Sections for Fast Reactor Calculations, Israel AEC Report IA-899 (to be published).